

We Claim:

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1. An apparatus for forming an absorbent paper sheet product comprising:
a moving foraminous endless fabric;
means for depositing a nascent web for said absorbent paper sheet on said foraminous endless fabric;
a moving endless pressing blanket having a void volume;
a Yankee drying cylinder; and
a pressing unit engaging said pressing blanket adapted to urge said nascent web for said absorbent paper sheet on said foraminous endless fabric into engagement with said Yankee drying cylinder thereby forming a nip, said pressing unit being configured to create a peak engagement pressure of at least about 2000 kN/m² at an overall line load of less than about 240 kN/m.
2. The apparatus of claim 1, wherein said pressing unit is additionally configured to impose an asymmetrical pressure distribution upon said nascent web, said asymmetrical pressure distribution being skewed such that the pressure declines from a peak pressure to a value of 20% of said peak pressure over a nip length which is no more than about half of the nip length over which it rose to said peak pressure from 20% of said peak pressure.
3. The apparatus of claim 1, wherein said foraminous endless fabric is a press felt or an impression fabric.
4. The apparatus of claim 1, wherein the means for forming a nascent web is selected from a crescent former, a twin wire former, a suction breast roll former, or a

fourdrinier former.

5. The apparatus of claim 1, further comprising a creping blade for removing said absorbent paper sheet from said Yankee dryer.

6. The apparatus of claim 1, wherein said pressing unit is configured to disengage said web from said foraminous endless fabric such that rewet of said nascent web by said foraminous endless fabric is less than about 50% of the rewet predicted by the Sweet equations based upon the properties of said foraminous endless fabric and said nascent web.

7. The apparatus of claim 6, wherein said pressing unit is configured to disengage said web from said foraminous endless fabric at a nip length of less than about one inch from the point the nip pressure reaches zero.

8. The apparatus of claim 6, wherein said pressing unit is configured to both disengage said web from said foraminous endless fabric and disengage said foraminous endless fabric from said pressing blanket at a nip length of less than about one inch from the point the nip pressure reaches zero.

9. The apparatus of claim 1, wherein the pressing blanket is a blind drilled blanket.

10. The apparatus of claim 9, wherein the blind drilled blanket has a plurality of holes formed thereon.

11. The apparatus of claim 10, wherein the holes are sequentially arranged in the machine direction.

12. The apparatus of claim 10, wherein the diameter of the holes is about 0.2

to about 10 mm.

13. The apparatus of claim 10, wherein the holes extend into but not through the blanket.

14. The apparatus of claim 10, wherein the angle of the holes as measured along a hole wall vertically extending in the machine direction ranges from about 45 to about 135 degrees.

15. The apparatus of claim 10, wherein the angle of the holes as measured along a hole wall vertically extending in the cross-machine direction can range from about 45 to about 135 degrees.

16. The apparatus of claim 10, wherein the spacing between adjacent holes is about 1 to about 20 mm.

17. The apparatus of claim 11, wherein a plurality of rows of holes are sequentially arranged in the cross-machine direction.

18. The apparatus of claim 17, wherein the spacing between rows is about 1 to about 20 mm.

19. The apparatus of claim 17, wherein the rows of holes are arranged in a geometric pattern.

20. The apparatus of claim 19, wherein the geometric pattern is arranged so that the holes in each row are aligned in the cross-machine direction.

21. The apparatus of claim 19, wherein the geometric pattern is arranged so that the holes in each row are offset in the cross-machine direction.

22. The apparatus of claim 19, wherein the geometric pattern is arranged so

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that the holes in each row are aligned in the machine direction.

23. The apparatus of claim 19, wherein the geometric pattern is arranged so that the holes in each row are offset in the machine direction.

24. The apparatus of claim 17, wherein one or more individual hole or row of holes has the same configuration as one or more other individual hole or row of holes.

25. The apparatus of claim 1, wherein the blanket is a grooved blanket.

26. The apparatus of claim 25, wherein the grooved blanket has at least one groove that extends in the machine direction.

27. The apparatus of claim 26, wherein the width of the widest portion of a groove is about 0.1 to about 6 mm.

28. The apparatus of claim 26, wherein the groove extends into but not through the blanket and has a depth of about 0.1 to about 8 mm.

29. The apparatus of claim 26, wherein the groove bevel is about 0 to about 45 degrees.

30. The apparatus of claim 26, wherein the groove angle is about 45 to about 135 degrees, with 90 degrees being orthogonal to the cross-machine direction.

31. The apparatus of claim 26, wherein a plurality of grooves are sequentially arranged in the cross-machine direction of the blanket.

32. The apparatus of claim 31, wherein each of the plurality of grooves circumscribe the blanket.

33. The apparatus of claim 31, wherein the groove width is about 0.4 to about

3 mm.

34. The apparatus of claim 31, wherein the rows of grooves are arranged in a geometric pattern.

35. The apparatus of claim 31, wherein one or more individual groove has the same configuration as one or more other individual groove.

36. The apparatus of claim 31, wherein the land width is about 0.2 to about 25 mm.

37. The apparatus of claim 31, wherein the open area is up to about 80% of the total blanket area.

38. A moving endless pressing blanket for forming an absorbent paper sheet product produced by a pressing unit engaging said pressing blanket adapted to urge a nascent web on a foraminous endless fabric into engagement with a Yankee drying cylinder, said pressing unit being configured to create a peak engagement pressure of at least about 2000 kN/m^2 at an overall line load of less than about 240 kN/m , said pressing blanket comprising a void volume less than about $1500 \text{ cm}^3/\text{m}^2$.

39. The apparatus of claim 38, wherein the void volume is achieved by a blind drilled blanket.

40. The apparatus of claim 39, wherein the blind drilled blanket has a plurality of holes arranged in a predetermined geometric pattern.

41. The apparatus of claim 38, wherein the void volume is achieved by a grooved blanket.

42. The apparatus of claim 41, wherein the grooved blanket has a plurality of

grooves arranged in a predetermined geometric pattern.

43. A method of making an absorbent paper sheet product comprising:
depositing a nascent web for said absorbent paper sheet product on a moving
foraminous endless fabric; and
contacting said moving foraminous endless fabric bearing said deposited
nascent web with a moving endless pressing void volume containing a pressing blanket
engaged with a pressing unit thereby forming a nip, said pressing unit being configured
to create a peak engagement pressure of at least about 2000 kN/m^2 at an overall line
load of less than about 240 kN/m .

44. The method of claim 43, wherein said pressing unit is additionally
configured to impose an asymmetrical pressure distribution upon said nascent web,
said asymmetrical pressure distribution being skewed such that the pressure declines
from a peak pressure to a value of 20% of said peak pressure over a nip length which is
no more than about half of the nip length over which it rose to said peak pressure from
20% of said peak pressure.

45. The method of claim 43, wherein said pressing unit is configured to
disengage said web from said foraminous endless fabric such that rewet of said
nascent web by said foraminous endless fabric is less than about 50% of the rewet
predicted by the Sweet equations based upon the properties of said foraminous
endless fabric and said nascent web.

46. The method of claim 45, wherein said pressing unit is configured to
disengage said web from said foraminous endless fabric at a nip length of less than

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about one inch from the point the nip pressure reaches zero.

47. The method of claim 45, wherein said pressing unit is configured to both disengage said web from said foraminous endless fabric and disengage said foraminous endless fabric from said pressing blanket at a nip length of less than about one inch from the point the nip pressure reaches zero.

48. The method of claim 43, wherein said nascent web contacts a heated transfer cylinder.

49. The method of claim 48, further comprising a creping blade for removing said absorbent sheet from said heated transfer cylinder.

50. The method of claim 43, wherein said moving void volume containing endless blanket engaged with said pressing unit forms said nip with a Yankee drying cylinder.

51. The method of claim 43, wherein said pressing unit is a shoe press.

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